

Assessment of Air Quality in the Shuttle and International Space Station (ISS) Based on Samples Returned by STS-100 at the Conclusion of 6A

The toxicological assessment of air samples returned at the end of the STS-100 (6A) flight to the ISS is reported. ISS air samples were taken in March and April 2001 from the Service Module, FGB, and U.S. Laboratory using grab sample canisters (GSCs) and/or formaldehyde badges. An unplanned "first-entry" sample of the MPLM2 (multipurpose logistics module) atmosphere was taken with a GSC, and preflight and end-of-mission samples were obtained from *Endeavour* using GSCs. Analytical methods have not changed from earlier reports, and all quality control measures were met for the data presented herein.

The two general criteria used to assess air quality are the total-non-methane-volatile organic hydrocarbons (NMVOCs) and the total T-value (minus the CO₂ and formaldehyde contribution). Because of the Freon 218 (octafluoropropane, OFP) leak, its contribution to the NMVOC is indicated in brackets. When comparing the NMVOC values with the 25 mg/m³ guideline, the OFP contributions should be subtracted. Control of atmospheric alcohols is important to the water recovery system engineers, hence total alcohols were also assessed in each sample. Formaldehyde (methanal) is quantified separately. These five indices are summarized below:

Sample Location	Date/Type	NMVOCs [OFP] (mg/m ³) (mg/m ³)		T Value ^a (units)	Alcohols (mg/m ³)	Methanol (mg/m ³)
SM	3/21/01	11	[6]	0.43	2.6	ns ^b
U.S. Lab	3/21/01	12	[8]	0.33	2.4	ns
FGB	4/9/01	28	[23]	0.44	1.7	ns
SM	4/9/01	33	[22]	0.96	1.9	0.019
Lab	4/9/01	GSC sample had low surrogate recovery				0.024
MPLM 2	4/23/01	14	[1]	1.09	4.9	ns
Shuttle mid-deck	4/19/01(preflt)	0.1	[0]	0.07	0.2	ns
Shuttle mid-deck	4/30/01(EOM) ^b	22	[17]	0.44	3.5	ns
Acceptable Guideline>>>		<25	[85000]	<1	<10	0.05

^a Formaldehyde and CO₂ not included in T calculation.

^b ns = not sampled and EOM = end of mission sample

Taken as a whole, these data suggest that air pollutants were controlled to acceptable levels to protect crew health. The increase in OFP between the March and April samples suggest that OFP was leaking from an ISS system faster than it was being scrubbed from the air. The concentration of OFP was far below any that would cause a health concern. To the extent that the samples were representative of each respective vehicle atmosphere, neither *Endeavour* nor MPLM2 contributed significantly to the alcohol load in the ISS atmosphere.

Enclosures

1a: Analytical Results of 6A Air Samples

1b: Analytical Results of STS-100 Air Samples

2a: T Values of 6A Air Samples

2b: T Values of STS-100 Air Samples

TABLE 1
ANALYTICAL RESULTS OF
ISS 6A CONTAINER AIR SAMPLES

CHEMICAL CONTAMINANT	CONCENTRATION				
	AA03056 S/N 1078 SERVICE MODULE 3/21/01@ 11:40 GMT	AA03057 S/N 1068 LAB 3/21/01@ 11:40 GMT	(mg/m3) AA03059 S/N 1033 FGB 4/9/01@ 18:18GMT	AA03060 S/N 1009 SERVICE MODULE 4/9/01@ 18:19GMT	AA03055 S/N 1031 MPLM 2 4/23/01@ 22:05GMT
TARGET COMPOUNDS (TO-14/POLAR)					
DICHLORODIFLUOROMETHANE	# TRACE	TRACE	TRACE	TRACE	<0.050
CHLOROMETHANE	TRACE	<0.050	<0.050	TRACE	0.05
1,2-DICHLORO-1,1,2,2-TETRAFLUOROETHANE	* <0.050	<0.050	<0.050	<0.050	<0.050
ACETALDEHYDE	0.22	0.21	0.22	0.25	0.22
METHANOL	0.13	0.09	0.09	0.09	0.10
VINYL CHLORIDE	<0.050	<0.050	<0.050	<0.050	<0.050
BROMOMETHANE	<0.050	<0.050	<0.050	<0.050	<0.050
ETHANOL	1.8	1.7	1.2	1.4	1.3
CHLOROETHANE	<0.050	<0.050	<0.050	<0.050	<0.050
ACETONITRILE	<0.050	<0.050	TRACE	TRACE	<0.050
PROPENAL	<0.020	<0.020	<0.020	<0.020	<0.020
ACETONE	0.21	0.18	0.16	0.15	1.8
PROPANAL	TRACE	TRACE	TRACE	TRACE	0.12
ISOPROPANOL	0.24	0.22	0.09	0.10	1.4
TRICHLOROFLUOROMETHANE	<0.050	<0.050	<0.050	<0.050	<0.050
FURAN	<0.050	<0.050	<0.050	<0.050	<0.050
ACRYLONITRILE	TRACE	TRACE	TRACE	TRACE	<0.050
PENTANE	<0.050	<0.050	<0.050	<0.050	<0.050
2-METHYL-2-PROPANOL	<0.050	<0.050	<0.050	<0.050	TRACE
METHYL ACETATE	TRACE	TRACE	<0.050	<0.050	<0.050
1,1-DICHLOROETHENE	<0.050	<0.050	<0.050	<0.050	<0.050
DICHLOROMETHANE	0.24	0.22	0.23	0.20	2.7
3-CHLOROPROPENE	<0.050	<0.050	<0.050	<0.050	<0.050
1,1,2-TRICHLORO-1,1,2-TRIFLUOROETHANE	TRACE	TRACE	TRACE	TRACE	0.25
N-PROPANOL	TRACE	TRACE	TRACE	TRACE	0.06
1,1-DICHLOROETHANE	<0.050	<0.050	<0.050	<0.050	<0.050
BUTANAL	TRACE	TRACE	TRACE	TRACE	TRACE
2-BUTANONE	TRACE	TRACE	TRACE	TRACE	0.81
1,2-DICHLOROETHENE	<0.050	<0.050	<0.050	<0.050	<0.050
2-METHYLFURAN	<0.050	<0.050	<0.050	<0.050	<0.050
ETHYL ACETATE	0.07	0.06	TRACE	TRACE	0.06
HEXANE	<0.050	<0.050	<0.050	<0.050	TRACE
CHLOROFORM	<0.050	<0.050	<0.050	<0.050	TRACE
2-BUTENAL	TRACE	<0.050	<0.050	<0.050	<0.050
1,2-DICHLOROETHANE	TRACE	TRACE	TRACE	TRACE	<0.050
1,1,1-TRICHLOROETHANE	<0.050	<0.050	<0.050	<0.050	TRACE
N-BUTANOL	0.17	0.16	0.14	0.14	0.25
BENZENE	<0.050	<0.050	<0.050	<0.050	TRACE
CARBON TETRACHLORIDE	<0.050	<0.050	<0.050	<0.050	<0.050
2-PENTANONE	TRACE	TRACE	<0.050	<0.050	<0.050
PENTANAL	TRACE	TRACE	TRACE	TRACE	TRACE
1,2-DICHLOROPROPANE	<0.050	<0.050	<0.050	<0.050	0.13
1,4-DIOXANE	<0.050	<0.050	<0.050	<0.050	<0.050
TRICHLOROETHENE	<0.050	<0.050	<0.050	<0.050	TRACE
2,5-DIMETHYLFURAN	<0.050	<0.050	<0.050	<0.050	<0.050
4-METHYL-2-PENTANONE	<0.050	<0.050	TRACE	<0.050	0.09
CIS-1,3-DICHLOROPROPENE	<0.050	<0.050	<0.050	<0.050	<0.050
2-PENTENAL	<0.050	TRACE	TRACE	<0.050	<0.050
TRANS-1,3-DICHLOROPROPENE	<0.050	<0.050	<0.050	<0.050	<0.050
1,1,2-TRICHLOROETHANE	<0.050	<0.050	<0.050	<0.050	<0.050
TOLUENE	TRACE	TRACE	TRACE	TRACE	0.49
HEXANAL	TRACE	TRACE	TRACE	TRACE	TRACE
MESITYL OXIDE	<0.050	<0.050	<0.050	<0.050	TRACE
1,2-DIBROMOETHANE	<0.050	<0.050	<0.050	<0.050	<0.050
BUTYL ACETATE	TRACE	TRACE	TRACE	TRACE	TRACE
TETRACHLOROETHENE	<0.050	<0.050	<0.050	<0.050	TRACE
CHLOROBENZENE	<0.050	<0.050	<0.050	<0.050	<0.050
ETHYL BENZENE	TRACE	TRACE	TRACE	TRACE	TRACE
M- + P-XYLENES	TRACE	TRACE	TRACE	TRACE	TRACE
2-HEPTANONE	<0.050	<0.050	<0.050	<0.050	TRACE
CYCLOHEXANONE	TRACE	TRACE	TRACE	TRACE	TRACE
HEPTANAL	TRACE	TRACE	TRACE	TRACE	TRACE
STYRENE	<0.050	<0.050	<0.050	<0.050	<0.050
1,1,2,2-TETRACHLOROETHANE	<0.050	<0.050	<0.050	<0.050	<0.050
O-XYLENE	0.07	0.05	0.07	0.07	0.05
1,3,5-TRIMETHYLBENZENE	<0.050	<0.050	<0.050	<0.050	<0.050
1,2,4-TRIMETHYLBENZENE	<0.050	<0.050	<0.050	<0.050	<0.050
1,3-DICHLOROBENZENE	<0.050	<0.050	<0.050	<0.050	<0.050
1,4-DICHLOROBENZENE	<0.050	<0.050	<0.050	<0.050	<0.050
1,2-DICHLOROBENZENE	<0.050	<0.050	<0.050	<0.050	<0.050
1,2,4-TRICHLOROBENZENE	<0.050	<0.050	<0.050	<0.050	<0.050
HEXACHLORO-1,3-BUTADIENE	<0.050	<0.050	<0.050	<0.050	<0.050

CHEMICAL CONTAMINANT	CONCENTRATION (mg/m3)				
	AA03056 S/N 1078 SERVICE MODULE 3/21/01@ 11:40 GMT	AA03057 S/N 1068 LAB 3/21/01@ 11:40 GMT	AA03059 S/N 1033 FGB 4/9/01@ 18:18GMT	AA03060 S/N 1009 SERVICE MODULE 4/9/01@ 18:19GMT	AA03055 S/N 1031 MPLM 2 4/23/01@ 22:05GMT
TARGET COMPOUNDS (TOXIC)					
1,3-BUTADIENE	<0.050	<0.050	<0.050	<0.050	<0.050
ETHYLENE OXIDE	<0.050	<0.050	<0.050	<0.050	<0.050
CARBON DISULFIDE	TRACE	TRACE	TRACE	TRACE	TRACE
2-METHYL-2-PROPENAL	TRACE	<0.050	<0.050	<0.050	TRACE
3-BUTEN-2-ONE	TRACE	TRACE	TRACE	<0.050	TRACE
DIMETHYLDISULFIDE	<0.050	<0.050	<0.050	<0.050	<0.050
2-ETHOXYETHANOL	<0.050	<0.050	<0.050	<0.050	<0.050
OCTAMETHYLCYCLOTETRAILOXANE ***	0.68	0.16	0.75	3.9	0.68
NON-TARGET COMPOUNDS					
OCTAFLUOROPROPANE	5.6	8.0	23	22	0.76
BROMOTRIFLUOROMETHANE	0.07	0.07	0.01	0.02	0.01
TRIMETHYLSILANOL	0.06	0.07	0.07	0.06	0.85
CYCLOHEXANE	0.01	0.01	0.01	0.01	0.19
HEXAMETHYLCYCLOTRIILOXANE ***	0.76	0.23	1.2	3.9	1.6
LIMONENE	0.04	0.03	0.08	0.08	0.01
DECAMETHYLCYCLOPENTASILOXANE ***	0.57	0.60	0.36	0.75	0.11
TARGET COMPOUNDS (GC)					
ETHYLENE	ND	ND	ND	ND	ND
CARBON MONOXIDE	ND	0.32	ND	ND	1.7
METHANE	9.2	10	1.1	1.0	1.6
HYDROGEN	1.3	1.4	1.4	1.1	ND
CARBON DIOXIDE	7400	7600	11000	8200	700
TOTAL ALCOHOL	2.6	2.4	1.7	1.9	4.9
TOTAL CONCENTRATION (NON-METHANE HYDROCARBONS)	11	12	28	33	14

* <: Value is less than the laboratory report detection limit.

TRACE: Amount detected is sufficient for compound identification only. Calculations are based on one-half of the laboratory report detection limit
(1.1 mg/m3 for CO; 0.65 mg/m3 for CH4; 0.41 mg/m3 for H2; 0.05 mg/m3 for VOCs; and 0.02 mg/m3 for propenal.)

*** Siloxane compounds are common contaminants and measurements are not under statistical control.

TABLE 1 b
ANALYTICAL RESULTS OF
STS-100 CONTAINER AIR SAMPLES

CHEMICAL CONTAMINANT	CONCENTRATION (mg/m3)		
	AA03045 S/N1005 PREFLIGHT 4/19/01 @ 09:15EDT	AA03054 S/N1050 MIDDECK 11/12:55 (4/30/01 @ 06:35GMT)	AA03061 S/N1081 TRIP CONTROL (3/1/01-5/10/01)
TARGET COMPOUNDS (TO-14/POLAR)			
DICHLORODIFLUOROMETHANE	<0.050	TRACE	<0.050
CHLOROMETHANE	<0.050	TRACE	<0.050
1,2-DICHLORO-1,1,2,2-TETRAFLUOROETHANE	<0.050	<0.050	<0.050
ACETALDEHYDE	TRACE	0.12	TRACE
METHANOL	TRACE	0.05	TRACE
VINYL CHLORIDE	<0.050	<0.050	<0.050
BROMOMETHANE	<0.050	<0.050	<0.050
ETHANOL	TRACE	1.4	TRACE
CHLOROETHANE	<0.050	<0.050	<0.050
ACETONITRILE	<0.050	<0.050	<0.050
PROPENAL	<0.020	<0.020	<0.020
ACETONE	TRACE	0.61	TRACE
PROPANAL	TRACE	TRACE	TRACE
ISOPROPANOL	TRACE	1.4	TRACE
TRICHLOROFLUOROMETHANE	<0.050	<0.050	<0.050
FURAN	<0.050	<0.050	<0.050
ACRYLONITRILE	<0.050	<0.050	<0.050
PENTANE	<0.050	<0.050	<0.050
2-METHYL-2-PROPANOL	<0.050	TRACE	<0.050
METHYL ACETATE	<0.050	<0.050	<0.050
1,1-DICHLOROETHENE	<0.050	<0.050	<0.050
DICHLOROMETHANE	<0.050	0.32	<0.050
3-CHLOROPROPENE	<0.050	<0.050	<0.050
1,1,2-TRICHLORO-1,1,2-TRIFLUOROETHANE	<0.050	<0.050	<0.050
N-PROPANOL	<0.050	TRACE	<0.050
1,1-DICHLOROETHANE	<0.050	<0.050	<0.050
BUTANAL	TRACE	TRACE	TRACE
2-BUTANONE	TRACE	TRACE	TRACE
1,2-DICHLOROETHENE	<0.050	<0.050	<0.050
2-METHYLFURAN	<0.050	<0.050	<0.050
ETHYL ACETATE	<0.050	<0.050	<0.050
HEXANE	<0.050	<0.050	<0.050
CHLOROFORM	<0.050	<0.050	<0.050
2-BUTENAL	<0.050	<0.050	<0.050
1,2-DICHLOROETHANE	<0.050	<0.050	<0.050
1,1,1-TRICHLOROETHANE	<0.050	<0.050	<0.050
N-BUTANOL	TRACE	TRACE	<0.050
BENZENE	<0.050	<0.050	<0.050
CARBON TETRACHLORIDE	<0.050	<0.050	<0.050
2-PENTANONE	<0.050	<0.050	<0.050
PENTANAL	TRACE	<0.050	TRACE
1,2-DICHLOROPROPANE	<0.050	<0.050	<0.050
1,4-DIOXANE	<0.050	<0.050	<0.050
TRICHLOROETHENE	<0.050	<0.050	<0.050
2,5-DIMETHYLFURAN	<0.050	<0.050	<0.050
4-METHYL-2-PENTANONE	<0.050	<0.050	<0.050
CIS-1,3-DICHLOROPROPENE	<0.050	<0.050	<0.050
2-PENTENAL	<0.050	<0.050	<0.050
TRANS-1,3-DICHLOROPROPENE	<0.050	<0.050	<0.050
1,1,2-TRICHLOROETHANE	<0.050	<0.050	<0.050
TOLUENE	<0.050	TRACE	<0.050
HEXANAL	<0.050	<0.050	TRACE
MESITYL OXIDE	<0.050	<0.050	<0.050
1,2-DIBROMOETHANE	<0.050	<0.050	<0.050
BUTYL ACETATE	<0.050	<0.050	<0.050
TETRACHLOROETHENE	<0.050	<0.050	<0.050
CHLOROBENZENE	<0.050	<0.050	<0.050
ETHYL BENZENE	<0.050	<0.050	<0.050
M- + P-XYLENES	<0.050	TRACE	<0.050
2-HEPTANONE	<0.050	<0.050	<0.050
CYCLOHEXANONE	<0.050	<0.050	<0.050
HEPTANAL	<0.050	<0.050	<0.050
STYRENE	<0.050	<0.050	<0.050
1,1,2,2-TETRACHLOROETHANE	<0.050	<0.050	<0.050
O-XYLENE	<0.050	<0.050	<0.050
1,3,5-TRIMETHYLBENZENE	<0.050	<0.050	<0.050
1,2,4-TRIMETHYLBENZENE	<0.050	<0.050	<0.050
1,3-DICHLOROBENZENE	<0.050	<0.050	<0.050

1,4-DICHLOROBENZENE	<0.050	<0.050	<0.050
1,2-DICHLOROBENZENE	<0.050	<0.050	<0.050
1,2,4-TRICHLOROBENZENE	<0.050	<0.050	<0.050
HEXACHLORO-1,3-BUTADIENE	<0.050	<0.050	<0.050
CHEMICAL CONTAMINANT	CONCENTRATION (mg/m3)		
	AA03045 S/N1005 PREFLIGHT 4/19/01 @ 09:15EDT	AA03054 S/N1050 MIDDECK 11/12:55 (4/30/01 @ 06:35GMT)	AA03061 S/N1081 TRIP CONTROL (3/1/01-5/10/01)
TARGET COMPOUNDS (TOXIC)			
1,3-BUTADIENE	<0.050	<0.050	ND
ETHYLENE OXIDE	<0.050	<0.050	ND
CARBON DISULFIDE	<0.050	TRACE	ND
2-METHYL-2-PROPENAL	<0.050	<0.050	ND
3-BUTEN-2-ONE	<0.050	<0.050	ND
DIMETHYLDISULFIDE	<0.050	<0.050	ND
2-ETHOXYETHANOL	<0.050	<0.050	ND
OCTAMETHYLCYCLOTETRASILOXANE ***	0.08	TRACE	0.06
NON-TARGET COMPOUNDS			
OCTAFLUOROPROPANE	BL	17	BL
BROMOTRIFLUOROMETHANE	BL	0.75	BL
DECAMETHYLCYCLOPENTASILOXANE ***	BL	1.1	0.03
TARGET COMPOUNDS (GC)			
ETHYLENE	ND	ND	ND
CARBON MONOXIDE	ND	3.7	ND
METHANE	1.2	28	ND
HYDROGEN	ND	7.7	ND
CARBON DIOXIDE	680	6040	55
TOTAL CONCENTRATION (NON-METHANE HYDROCARBONS)	0.08	22	0.09

< : Value is less than the laboratory report detection limit.

TRACE: Amount detected is sufficient for compound identification only. Calculations are based on one-half of the laboratory report detection limit (1.1 mg/m3 for CO; 0.65 mg/m3 for CH4; 0.41 mg/m3 for H2; 0.05 mg/m3 for VOCs; and 0.02 mg/m3 for propenal.)

BL: Area below the search routine limit (<20% of the fluorobenzene peak area).

*** Siloxane compounds are common contaminants and measurements are not under statistical control.

TABLE 2
ANALYTICAL RESULTS OF
ISS 6A CONTAINER AIR SAMPLES

CHEMICAL CONTAMINANT	T-VALUE				
	AA03056 S/N 1078 SERVICE MODULE 3/21/01@ 11:40 GMT	AA03057 S/N 1068 LAB 3/21/01@ 11:40 GMT	AA03059 S/N 1033 FGB 4/9/01@ 18:18GMT	AA03060 S/N 1009 SERVICE MODULE 4/9/01@ 18:19GMT	AA03055 S/N 1031 MPLM 2 4/23/01@ 22:05GMT
TARGET COMPOUNDS (TO-14/POLAR)					
DICHLORODIFLUOROMETHANE	0.00005	0.00005	0.00005	0.00005	ND
CHLOROMETHANE	0.00061	ND	ND	0.00061	0.00127
1,2-DICHLORO-1,1,2,2-TETRAFLUOROETHANE	* ND	ND	ND	ND	ND
ACETALDEHYDE	0.02431	0.02329	0.02475	0.02766	0.02475
METHANOL	0.03314	0.02283	0.02182	0.02245	0.02536
VINYL CHLORIDE	ND	ND	ND	ND	ND
BROMOMETHANE	ND	ND	ND	ND	ND
ETHANOL	0.00092	0.00083	0.00061	0.00068	0.00067
CHLOROETHANE	ND	ND	ND	ND	ND
ACETONITRILE	ND	ND	0.00373	0.00373	ND
PROPENAL	ND	ND	ND	ND	ND
ACETONE	0.00410	0.00353	0.00329	0.00296	0.03515
PROPANAL	0.00694	0.00694	0.00694	0.00694	0.03401
ISOPROPANOL	0.00157	0.00149	0.00061	0.00064	0.00951
TRICHLOROFLUOROMETHANE	ND	ND	ND	ND	ND
FURAN	ND	ND	ND	ND	ND
ACRYLONITRILE	0.00893	0.00893	0.00893	0.00893	ND
PENTANE	ND	ND	ND	ND	ND
2-METHYL-2-PROPANOL	ND	ND	ND	ND	0.00021
METHYL ACETATE	0.00021	0.00021	ND	ND	ND
1,1-DICHLOROETHENE	ND	ND	ND	ND	ND
DICHLOROMETHANE	0.02351	0.02165	0.02290	0.01998	0.26879
3-CHLOROPROPENE	ND	ND	ND	ND	ND
1,1,2-TRICHLORO-1,1,2-TRIFLUOROETHANE	0.00006	0.00006	0.00006	0.00006	0.00062
N-PROPANOL	0.00026	0.00026	0.00026	0.00026	0.00062
1,1-DICHLOROETHANE	ND	ND	ND	ND	ND
BUTANAL	0.00568	0.00568	0.00568	0.00568	0.00568
2-BUTANONE	0.00083	0.00083	0.00083	0.00083	0.02684
1,2-DICHLOROETHENE	ND	ND	ND	ND	ND
2-METHYLFURAN	ND	ND	ND	ND	ND
ETHYL ACETATE	0.00038	0.00033	0.00014	0.00014	0.00032
HEXANE	ND	ND	ND	ND	0.00014
CHLOROFORM	ND	ND	ND	ND	0.00510
2-BUTENAL	0.01471	ND	ND	ND	ND
1,2-DICHLOROETHANE	0.02500	0.02500	0.02500	0.02500	ND
1,1,1-TRICHLOROETHANE	ND	ND	ND	ND	0.00016
N-BUTANOL	0.00431	0.00394	0.00347	0.00338	0.00621
BENZENE	ND	ND	ND	ND	0.12500
CARBON TETRACHLORIDE	ND	ND	ND	ND	ND
2-PENTANONE	0.00036	0.00036	ND	ND	ND
PENTANAL	0.00472	0.00472	0.00472	0.00472	0.00472
1,2-DICHLOROPROPANE	ND	ND	ND	ND	0.00314
1,4-DIOXANE	ND	ND	ND	ND	ND
TRICHLOROETHENE	ND	ND	ND	ND	0.00250
2,5-DIMETHYLFURAN	ND	ND	ND	ND	ND
4-METHYL-2-PENTANONE	ND	ND	0.00018	ND	0.00066
CIS-1,3-DICHLOROPROPENE	ND	ND	ND	ND	ND
2-PENTENAL	ND	0.01190	0.01190	ND	ND
TRANS-1,3-DICHLOROPROPENE	ND	ND	ND	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND	ND	ND	ND
TOLUENE	0.00042	0.00042	0.00042	0.00042	0.00821
HEXANAL	0.00410	0.00410	0.00410	0.00410	0.00410
MESITYL OXIDE	ND	ND	ND	ND	0.00063
1,2-DIBROMOETHANE	ND	ND	ND	ND	ND
BUTYL ACETATE	0.00013	0.00013	0.00013	0.00013	0.00013
TETRACHLOROETHENE	ND	ND	ND	ND	0.00074
CHLOROBENZENE	ND	ND	ND	ND	ND
ETHYL BENZENE	0.00019	0.00019	0.00019	0.00019	0.00019
M- + P-XYLENES	0.00011	0.00011	0.00011	0.00011	0.00011
2-HEPTANONE	ND	ND	ND	ND	0.00109
CYCLOHEXANONE	0.00042	0.00042	0.00042	0.00042	0.00042
HEPTANAL	0.00357	0.00357	0.00357	0.00357	0.00357
STYRENE	ND	ND	ND	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND
O-XYLENE	0.00030	0.00023	0.00033	0.00031	0.00023
1,3,5-TRIMETHYLBENZENE	ND	ND	ND	ND	ND
1,2,4-TRIMETHYLBENZENE	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND	ND
1,2,4-TRICHLOROBENZENE	ND	ND	ND	ND	ND
HEXACHLORO-1,3-BUTADIENE	ND	ND	ND	ND	ND

CHEMICAL CONTAMINANT	T-VALUE				
	AA03056 S/N 1078 SERVICE MODULE 3/21/01@ 11:40 GMT	AA03057 S/N 1068 LAB 3/21/01@ 11:40 GMT	AA03059 S/N 1033 FGB 4/9/01@ 18:18GMT	AA03060 S/N 1009 SERVICE MODULE 4/9/01@ 18:19GMT	AA03055 S/N 1031 MPLM 2 4/23/01@ 22:05GMT
TARGET COMPOUNDS (TOXIC)					
1,3-BUTADIENE	ND	ND	ND	ND	ND
ETHYLENE OXIDE	ND	ND	ND	ND	ND
CARBON DISULFIDE	0.00156	0.00156	0.00156	0.00156	0.00156
2-METHYL-2-PROPENAL	0.01471	ND	ND	ND	0.01471
3-BUTEN-2-ONE	0.05814	0.05814	0.05814	ND	0.05814
DIMETHYLDISULFIDE	ND	ND	ND	ND	ND
2-ETHOXYETHANOL	ND	ND	ND	ND	ND
OCTAMETHYLCYCLOTETRAILOXANE ***	0.05700	0.01346	0.06260	0.32596	0.05676
NON-TARGET COMPOUNDS					
OCTAFLUOROPROPANE	0.00007	0.00009	0.00027	0.00026	0.00001
BROMOTRIFLUOROMETHANE	0.00001	0.00001	0.00000	0.00000	0.00000
TRIMETHYLSILANOL	0.00161	0.00181	0.00187	0.00151	0.02120
CYCLOHEXANE	0.00005	0.00005	0.00003	0.00003	0.00092
HEXAMETHYLCYCLOTRISILOXANE ***	0.08430	0.02575	0.13552	0.43433	0.17267
LIMONENE	0.00007	0.00005	0.00014	0.00014	0.00001
DECAMETHYLCYCLOPENTASILOXANE ***	0.03829	0.04024	0.02427	0.04999	0.00754
TARGET COMPOUNDS (GC)					
ETHYLENE	ND	ND	ND	ND	ND
CARBON MONOXIDE	ND	0.02909	ND	ND	0.15455
METHANE	0.00242	0.00263	0.00029	0.00026	0.00042
HYDROGEN	0.00382	0.00412	0.00412	0.00324	ND
CARBON DIOXIDE	0.56923	0.58462	0.84615	0.63077	0.05385
TOTAL T-VALUE	1.00110	0.91364	1.29012	1.59201	1.14315

* ND : Value is less than the laboratory report detection limit.

TABLE 2 b
ANALYTICAL RESULTS OF
STS-100 CONTAINER AIR SAMPLES

CHEMICAL CONTAMINANT	T-VALUE		
	AA03045 S/N1005 PREFLIGHT 4/19/01 @ 09:15EDT	AA03054 S/N1050 MIDDECK 11/12:55 (4/30/01 @ 06:35GMT)	AA03061 S/N1081 TRIP CONTROL (3/1/01-5/10/01)
TARGET COMPOUNDS (TO-14/POLAR)			
DICHLORODIFLUOROMETHANE	ND	0.00005	ND
CHLOROMETHANE	ND	0.00061	ND
1,2-DICHLORO-1,1,2,2-TETRAFLUOROETHANE	ND	ND	ND
ACETALDEHYDE	0.00278	0.01281	0.00278
METHANOL	0.00625	0.01267	0.00625
VINYL CHLORIDE	ND	ND	ND
BROMOMETHANE	ND	ND	ND
ETHANOL	0.00001	0.00070	0.00001
CHLOROETHANE	ND	ND	ND
ACETONITRILE	ND	ND	ND
PROPENAL	ND	ND	ND
ACETONE	0.00050	0.01224	0.00050
PROPANAL	0.00175	0.00175	0.00175
ISOPROPANOL	0.00017	0.00907	0.00017
TRICHLOROFLUOROMETHANE	ND	ND	ND
FURAN	ND	ND	ND
ACRYLONITRILE	ND	ND	ND
PENTANE	ND	ND	ND
2-METHYL-2-PROPANOL	ND	0.00021	ND
METHYL ACETATE	ND	ND	ND
1,1-DICHLOROETHENE	ND	ND	ND
DICHLOROMETHANE	ND	0.00647	ND
3-CHLOROPROPENE	ND	ND	ND
1,1,2-TRICHLORO-1,1,2-TRIFLUOROETHANE	ND	ND	ND
N-PROPANOL	ND	0.00026	ND
1,1-DICHLOROETHANE	ND	ND	ND
BUTANAL	0.00141	0.00141	0.00141
2-BUTANONE	0.00083	0.00083	0.00083
1,2-DICHLOROETHENE	ND	ND	ND
2-METHYLFURAN	ND	ND	ND
ETHYL ACETATE	ND	ND	ND
HEXANE	ND	ND	ND
CHLOROFORM	ND	ND	ND
2-BUTENAL	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND
1,1,1-TRICHLOROETHANE	ND	ND	ND
N-BUTANOL	0.00031	0.00031	ND
BENZENE	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND
2-PENTANONE	ND	ND	ND
PENTANAL	0.00118	ND	0.00118
1,2-DICHLOROPROPANE	ND	ND	ND
1,4-DIOXANE	ND	ND	ND
TRICHLOROETHENE	ND	ND	ND
2,5-DIMETHYLFURAN	ND	ND	ND
4-METHYL-2-PENTANONE	ND	ND	ND
CIS-1,3-DICHLOROPROPENE	ND	ND	ND
2-PENTENAL	ND	ND	ND
TRANS-1,3-DICHLOROPROPENE	ND	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND	ND
TOLUENE	ND	0.00042	ND
HEXANAL	ND	ND	0.00102
MESITYL OXIDE	ND	ND	ND
1,2-DIBROMOETHANE	ND	ND	ND
BUTYL ACETATE	ND	ND	ND
TETRACHLOROETHENE	ND	ND	ND
CHLOROBENZENE	ND	ND	ND
ETHYL BENZENE	ND	ND	ND
M- + P-XYLENES	ND	0.00011	ND
2-HEPTANONE	ND	ND	ND
CYCLOHEXANONE	ND	ND	ND
HEPTANAL	ND	ND	ND
STYRENE	ND	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND	ND
O-XYLENE	ND	ND	ND
1,3,5-TRIMETHYLBENZENE	ND	ND	ND
1,2,4-TRIMETHYLBENZENE	ND	ND	ND
1,3-DICHLOROENZENE	ND	ND	ND

1,4-DICHLOROBENZENE	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND
1,2,4-TRICHLOROBENZENE	ND	ND	ND
HEXACHLORO-1,3-BUTADIENE	ND	ND	ND
CHEMICAL CONTAMINANT	T-VALUE		
	AA03045 S/N1005 PREFLIGHT 4/19/01 @ 09:15EDT	AA03054 S/N1050 MIDDECK 11\12:55 (4/30/01 @ 06:35GMT)	AA03061 S/N1081 TRIP CONTROL (3/1/01-5/10/01)
TARGET COMPOUNDS (TOXIC)			
1,3-BUTADIENE	ND	ND	ND
ETHYLENE OXIDE	ND	ND	ND
CARBON DISULFIDE	ND	0.00156	ND
2-METHYL-2-PROPENAL	ND	ND	ND
3-BUTEN-2-ONE	ND	ND	ND
DIMETHYLDISULFIDE	ND	ND	ND
2-ETHOXYETHANOL	ND	ND	ND
OCTAMETHYLCYCLOTETRASILOXANE ***	0.00027	0.00009	0.00022
NON-TARGET COMPOUNDS			
OCTAFLUOROPROPANE	BL	0.00020	BL
BROMOTRIFLUOROMETHANE	BL	0.00007	BL
DECAMETHYLCYCLOPENTASILOXANE ***	BL	0.00725	0.00019
TARGET COMPOUNDS (GC)			
ETHYLENE	ND	ND	ND
CARBON MONOXIDE	ND	0.33636	ND
METHANE	0.00032	0.00737	ND
HYDROGEN	ND	0.02265	ND
CARBON DIOXIDE	0.05231	0.46462	0.00423
TOTAL T-VALUE	0.06810	0.90007	0.02055

ND : Value is less than the laboratory report detection limit.

BL: Area below the search routine limit (<20% of the fluorobenzene peak area).

*** Siloxane compounds are common contaminants and measurements are not under statistical control.